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ABSTRACT

This brief report describes a program of research which seeks to clarify the decision-making process whereby elementary school teachers determine the content of mathematics instruction for their students. The extent to which factors such as student characteristics, policies and practices of the school hierarchy, and advice or requests from others influence teachers' content decisions is hypothesized to be a function of the authority and/or power the teacher views the factor to have as well as the degree to which it explicitly addresses content decisions and is consistent with other factors in the teacher's milieu. In addition to analyses of fourth-grade textbooks and tests, case studies of seven teachers in grades 3-5 and three studies of state, district, and school policies were conducted. The findings of the first two of these studies are briefly discussed, followed by the design of the third study, conducted in grades 4 and 5 in six Michigan school districts. Teacher logs, teacher questionnaires, and interviews with teachers, principals, and curriculum coordinators were used to collect information. (MNS)

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CONTENT DETERMINANTS RESEARCH: AN OVERVIEW

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CONTENT DETERMINANTS RESEARCH: AN OVERVIEW

The program of research being conducted by the Content Determinants group seeks to clarify the decision-making process whereby elementary school teachers determine the content of mathematics instruction for students in their classrooms. Content decisions include how much time to allocate to the subject matter area over the course of a full school year, what topics to teach to which students, when and in what order, and to what standards of achievement. Collectively, these content decisions are taken to determine much of the variance (across states, school districts, schools, classrooms, and even within classrooms) in student opportunity to learn mathematics.

Teachers are viewed as political brokers in the process of content determination. They have some discretion to follow their own convictions, but they are subject to a variety of factors that bear on their content decisions (e.g., student characteristics, policies, and practices of the school hierarchy, advice and requests from other individuals).

The extent to which teachers' content decisions are influenced by any of these factors is hypothesized to be a function of the authority and/or power that the teacher views the factor to have as well as the degree to which the factor explicitly addresses content decisions and is consistent with other factors in the teacher's milieu. Policies gain authority through appeal to law or rule, consistency with social norms, agreement with expert opinion or support from charismatic individuals. The power of a policy is increased through rewards and sanctions.

Past Work

Over the course of the group's eight years of research, several different approaches have been taken to address questions concerning teacher content decision making and student opportunities to learn. Early work addressed

questions surrounding the ways teachers describe mathematics topics: at what level of detail topics are differentiated from one another and what language is used to describe these topic distinctions. This early work formed the basis for addressing questions concerning what content messages teachers receive, for example, from textbooks, tests and other instructional materials. A taxonomny of elementary school mathematics topics, as described by teachers, was developed and has been used to content analyze fourth-grade textbooks and standardized tests.

This work revealed that beyond a relatively small core of topics common to virtually all materials, there exists great variety among textbooks and between textbooks and tests in the topics they cover. Subsequent yearlong case studies of seven teachers (grades 3-5) found that not only were teachers' content decisions influenced by textbooks and tests, but that the nature of these influences varied markedly depending upon the teachers' own convictions, the students they were teaching, and a variety of other factors. This study and a policy-capturing study revealed that teachers were surprisingly influenced by school policies (state, district, and school); however, even though when judged in the abstract, these policies appeared quite weak (e.g., no monitoring or sanctions attached to compliance). The studies also found that teachers were more easily persuaded to add new content to what they had been teaching than they were to deleting old content to make way for the new. As a result, large numbers of topics were taught for a very short period of time (e.g., less than 10 minutes across a full school year).

These early findings led to a series of three studies focusing primarily upon state, district, and school policies, their nature and their effect, the third of which is the focus of this symposium. Data collection for the first two studies was completed prior to the current reform efforts, as was the first of four years of data collection for the third study.

The first of the three studies was designed to describe approaches taken by states to the formulation of content-relevant policies and practices. Seven states selected to represent variation in types of policies, overall strength of policies, and school population were studied. The methodological approach was through telephone interviews with state officials to acquire written descriptions of state policies and practices that might influence the content of elementary school mathematics. Here as in subsequent studies, particular attention was paid to policies on objectives, testing, textbooks, time allocations, promotion, grouping practices and professional development.

From this first study we found wide variation in approaches to state content policy formulation. Some states had strong policies that appeared designed to lead teachers to make content decisions outside existing norms (e.g., New York in its call for the teaching of probability and statistics), while other states with equally strong and comprehensive content policies appeared to be calling for all teachers to follow existing modal practices. A third style of content policy formulation was not to tell teachers directly what and how to teach mathematics but instead to require that districts have such policies of their own (e.g., Ohio requires districts to set educational goals and objectives, to have testing programs). Yet a fourth style was essentially to remain silent on the content of elementary school mathematics instruction (e.g., Michigan had only a state minimum competency testing program with no requirements other than participation in giving the tests and receiving the results).

In the second of the three studies, district policies, their relationships to state policies, and their perceived effects were studied in five of the seven states from the first study. Questionnaires were used to collect information from district mathematics coordinators, principals, and teachers, using a probability-in-proportion-to-student-enrollment design for each state.

While analyses of these data are not yet fully complete, a number of findings have emerged. For example, it appears that districts tend to adopt policies to extend and clarify state policies. Where states have relatively few and/or weak content policies, so do districts. More generally, we did not find much evidence of a coherent and purposeful approach to policy formulation. There appeared to be no coordinated approach to policy formulation, either to encourage and support teacher autonomy on the one hand or to prescribe and monitor teacher content decision making on the other. Rather, policies appeared to be considered one at a time, each on its own merit, and each in isolation from other district policies.

Study Design

The third study, and the focus of this symposium, was designed to: (1) describe teachers' content decisions in fourth- and fifth-grade classrooms and (2) establish the extent to which these decisions are a function of state-, district-, or school-level policies. Six Michigan school districts with differing approaches to policy formulation were selected and participated in the study: (a) three districts with strong policies prescribing what teachers may do in areas corresponding to content decisions (including districts with emerging policies, where teachers' responses to new policy initiatives could be observed), and (b) three districts following a building autonomy policy, where building-level policies and their effects, as well as stability of teacher content decisions in the absence of prescriptive district policies, could be studied. Three schools were selected in each district to contrast the socioeconomic status of the student body and teacher grouping practices when teaching mathematics. In each school, one fourth- and one fifth-grade teacher in each school participated so that grade-to-grade continuity of content could be studied.

The selection of research sites required several steps. Districts were needed that (1) were large enough that three elementary schools could participate, (2) had sufficient SES variation across schools so that contrasts on that variable were possible, (3) varied in the strength of their content policies, (4) had fourth-grade teachers that differed in their grouping practices in mathematics instruction and (5) were sufficiently near to Michigan State University that site visits could be feasible. Through state directories and nominations from knowledgeable persons, 51 districts were identified and for each the curriculum coordinator was interviewed by phone. From this information, 9 districts were selected and in each a survey of instructional practices in mathematics was conducted with all fourth-grade teachers. Using SES data provided by the states, policy information collected from the district curriculum coordinators and instructional practices information from the teachers, the final set of districts, schools and teachers was determined.

The original design included 18 schools and 36 teachers (actually 34 teachers since two teachers platooned to teach both fourth and fifth grades). Two teachers in one school were lost from the study in the initial weeks of the first year. By the end of data collection in the fall of 1985, 25 of the original teachers remained in the study (with equal attrition across the two grades).

Data Collection

The 1982-83 school year was the time of most intense data collection. The study, however, extended over school years 1982-83, 1983-84 and 1984-85.

Teacher logs of content were kept on a daily basis and described the content of mathematics instruction for each of three target students in each classroom studied: (a) the student judged by the teacher to be of highest mathematics aptitude, (b) a student judged to be at the 80th percentile within the class on mathematics aptitude and (c) a student judged to be at the 20th percentile. For each target student a daily log indicated (a) the amount of time for mathematics instruction, (b) the most important specific topics taught to that student (up to five topics)* and (c) an indication of the emphasis given to each topic during instruction (using a three-point scale but also translated into time on the topic). On each day's log, teachers also provided information about the format of instruction, what materials were used, and whether students were given seatwork and/or homework.

To standardize the definition of topics across teachers and time, a catalog of possible topics was provided to each teacher. The catalog identified topics in each of 18 major areas (e.g., multiplication of whole numbers, story problems, geometry). Specific topics in each area ranged from 15 to 40 in number (e.g., multiplication by multiple digit multiplier, relation of multiplication to division, estimation of products). In describing content for a specific student on a specific day, then, a teacher had only to look up the content taught in the catalog and record the topic codes on the log form.

Logs were kept daily and collected once each week. As logs were collected, they were edited for clarity following a set of detailed rules meant to standardize the editing process across teachers. When log information was incomplete or ambiguous, teachers were immediately contacted so they could provide clarification.

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* Importance was judged by the teacher.

Weekly questionnaires. In addition to keeping daily logs, teachers responded to a weekly questionnaire, collected at the same time as logs. In these questionnaires teachers indicated any workshops or conferences on mathematics they had attended, any conversations they had concerning the teaching of mathematics and any unique content taught to non-target students.

Teacher interviews. Teachers were interviewed three times during the course of the study, once in the fall of 1982, the year during which they kept logs, once at the end of that year in the spring of 1983, and finally during the spring of 1985. Interviews were in depth (averaging over an hour in length) and followed written, standardized protocols. Each interview was designed to clarify and expand upon information provided from other sources about teachers' content decisions, their knowledge of state, district and school policies and practices concerning those content decisions, and any effects of those policies and practices upon their mathematics instruction.

A principal interview was conducted using standardized protocols at the end of the school year during which teachers kept logs. The primary focus of the principal interview was to determine school-level policies and practices that might have bearing on teachers' mathematics content decisions. Also covered in these interviews were principals' perceptions of district and state policies and practices.

Teacher questionnaires. Participating teachers completed several extensive questionnaires over the course of the study. In the spring of the year prior to when teachers kept logs, they responded to a questionnaire indicating their grouping practices in teaching mathematics and the priority they placed on each

of several topics that might be taught in elementary school mathematics (e.g., topics not necessarily taught by everyone including statistics and probability, the use of calculators, geometry).

Just prior to the year when they kept logs and again at the very end of the study in the fall of 1985, participating teachers completed a detailed survey on state and district policies and practices concerning elementary school mathematics instruction.

In the fall prior to the year they kept logs and again in the fall of 1984 and the fall of 1985, participating teachers completed a questionnaire in which they described whether or not they had taught each of 70 topics in the year previously (to all or some of their students) and how likely they were to teach each topic to students in the coming year. In this questionnaire, teachers also indicated how much time they had spent on mathematics each day in the previous year, what changes they would make in their mathematics instruction if they were free to do whatever they wanted, and a series of questions concerning their "comfort" with each of several topics typically associated with eighth-grade mathematics content.

Two other questionnaires were completed in the fall prior to the year teachers kept logs. The first listed 18 general areas of mathematics content (e.g., fractions) and for each asked about the teacher's enjoyment in teaching the area, the amount of time the teacher expected to spend on the area, and the major influences on the teacher's choice of content for the area. In the other questionnaire, teachers were asked eight questions about each of 15 topics selected to represent the variety of content they might teach in fourth- or fifth-grade mathematics. The questions asked about experience teaching the topic, whether most fourth- or fifth-grade teachers taught the topic, at what grade levels the topic is chiefly taught.

District curriculum coordinator interviews were conducted four times, first in the spring prior to the year teachers kept logs, and then again in the summers of 1983, 1984, and 1985. In all cases, written, standardized interview protocols were followed. The purpose of each interview was to determine district policies and practices that might bear on teacher content decisions in elementary school mathematics. In each interview, curriculum coordinators were asked about instructional objectives, testing, textbooks, student grouping, retention, time allocations, district content emphases and special programs/technical assistance for elementary school mathematics. With the exception of the first interview, respondents were also asked to provide documents, reports, position papers, guidelines, workshop summaries and news releases that might describe and elaborate on district policies and their appeals to authority and power.

Initial Data Reduction

To make this comprehensive set of data more accessible to subsequent analyses, some initial data reduction procedures were implemented. For each district, brief summaries were written to describe each of the several types of district policies (instructional objectives, testing, textbooks, student placement [specifically, individualization, retention, student placement in classrooms, and within-class grouping], time allocation, district mathematics content emphases, teacher inservice and other [e.g., use of committees, specialists, special review cycles, etc.]). These summaries were prepared by the member of the research team who coordinated the data collection activities for the district and made clear any changes in district policies and practices that occurred during the three year period of study. Brief summaries were also written to describe the SES composition of the student body in each school and

the apparent affluence of the school and its surrounding neighborhood. Finally, for each teacher a summary was written to describe what appear from the interview data to be the strongest influences upon that teacher's content decisions in mathematics (e.g., the teacher's own convictions, district policies, SES of students).

Prior to writing the summaries, members of the research team analyzed interview transcripts and summaries to identify and circle statements focusing on each of the following:

1. Seven types of content practices (time, topics, time on topics [i.e., emphasis], grouping, order, standards, styles of textbooks usage);
2. District policies or district practices that might have bearing on mathematics teaching in elementary schools (regardless of whether there was evidence of a policy effect upon the person being interviewed);
3. Teachers' convictions about content practices, teachers' strongly held beliefs about mathematics;
4. SES or SES stereotypes, regardless of their connections to content practices; and
5. Teacher value judgments about their students.

Statements in interview transcripts or summaries that provided information on any of the above five types were circled and labeled. Where appropriate, arrows were used to indicate attribution of an effect (e.g., district policy --> choice of topics) or an arrow with a slash through it to indicate a statement of no effect.

A series of manuscripts will draw on the summaries and interview analyses, as well as log and questionnaire data to describe content variation among teachers, schools and districts and to consider student SES, district policies and teachers' own convictions as potential explanations for that variation.